Spanish personal name variations in national and international biomedical databases: implications for information retrieval and bibliometric studies

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Objectives: The study sought to investigate how Spanish names are handled by national and international databases and to identify mistakes that can undermine the usefulness of these databases for locating and retrieving works by Spanish authors.

Methods: The authors sampled 172 articles published by authors from the University of Granada Medical School between 1987 and 1996 and analyzed the variations in how each of their names was indexed in Science Citation Index (SCI), MEDLINE, and Índice Médico Español (IME). The number and types of variants that appeared for each author's name were recorded and compared across databases to identify inconsistencies in indexing practices. We analyzed the relationship between variability (number of variants of an author's name) and productivity (number of items the name was associated with as an author), the consequences for retrieval of information, and the most frequent indexing structures used for Spanish names.

Results: The proportion of authors who appeared under more then one name was 48.1% in SCI, 50.7% in MEDLINE, and 69.0% in IME. Productivity correlated directly with variability: more than 50% of the authors listed on five to ten items appeared under more than one name in any given database, and close to 100% of the authors listed on more than ten items appeared under two or more variants. Productivity correlated inversely with retrievability: as the number of variants for a name increased, the number of items retrieved under each variant decreased. For the most highly productive authors, the number of items retrieved under each variant tended toward one. The most frequent indexing methods varied between databases. In MEDLINE and IME, names were indexed correctly as ''first surname second surname, first name initial middle name initial'' (if present) in 41.7% and 49.5% of the records, respectively. However, in SCI, the most frequent method was ''first surname, first name initial second name initial'' (48.0% of the records) and first surname and second surname run together, first name initial (18.3%).

Conclusions: Retrievability on the basis of author's name was poor in all three databases. Each database uses accurate indexing methods, but these methods fail to result in consistency or coherence for specific entries. The likely causes of inconsistency are: (1) use by authors of variants of their names during their publication careers, (2) lack of authority control in all three databases, (3) the use of an inappropriate indexing method for Spanish names in SCI, (4) authors' inconsistent behaviors, and (5) possible editorial interventions by some journals. We offer some suggestions as to how to avert the proliferation of author name variants in the databases.

INTRODUCTION

Because of their capacity to handle massive amounts of information, bibliographic databases (DB) have become an indispensable tool for retrieving scientific information and for performing bibliometric studies [1]. Their internal quality is a prime factor for ensuring efficient science communication and reliable, valid bibliometric analyses. Errors and inconsistencies in bibliographic records lead to the loss of relevant information in searches and interfere with access to documents [2]. In addition, errors can affect the operations of identification, selection, extraction, classification, ordering, and tabulation of data. Inaccuracies in bibliometric studies as a result of incorrect information supplied by DBs have been widely reported [3–9], and some authors have pointed out that these errors pose limitations serious enough to lead users to question the validity of bibliometric indicators [10–12].

The quality of bibliographic DBs has been widely questioned. Several studies have revealed deficient standardization measures for some fields in the registers and a high frequency of errors in the information contained therein [13–16]. That calls to improve the DBs should appear periodically is therefore not surprising. Some studies have identified features that can help to define quality and have suggested indicators and procedures that make it possible to measure and improve quality [17, 18].

The author name is one of the fields that has been widely shown to form the basis of many users' searches for information retrieval. However, this field has often been found to be inaccurately recorded. Even in the online catalogs of prestigious libraries, some studies have found that variability and inconsistencies in this field are frequent [19–21], despite rigorous authority control measures based on national and international standards. Although similar studies have yet to be undertaken for commercial DBs, the problem in these repositories is likely to be even worse. Many studies have denounced the lack of uniformity in author names and have tried to recommend appropriate strategies to ensure that searches on this field are successful [22–31].

Evaluations of the quality of references in scientific articles have revealed that author names are one of the largest sources of error [32]. Some of the mistakes can be attributed to inconsistencies in the DBs that researchers use to locate and reference their citations.

One of the reasons for the variability in personal names in bibliographic information systems is related to the diversity of structures that arise from historical and cultural traditions involved in naming persons in different countries [33]. In particular, this variability may be exacerbated when personal names are handled by linguistic systems different from the one in which they originated.

For Spanish authors indexed in international DBs—in which English is the dominant language—the problem is obvious given the complexity and different potential combinations of first and middle names and surnames (Appendix). Although different countries and linguistic communities use cataloging rules and international guidelines to keep the problems related to rules for dealing with author names in bibliographic online catalogs to a minimum [34–36], the rules and standards are often not applied consistently by the DBs. Moreover, important differences exist between the structures of English (simple or compound name and patronymic surname) and Spanish names (simple or compound name, patronymic and matronymic surnames), which further aggravate the problem but await detailed study. Articles (in Spanish) by Gómez [37] and López-Cózar [38] are among the first to call attention to the mishandling of Spanish names in English-language DBs.

In this article, the authors take a closer look at the origins and consequences of errors in Spanish names in national and international bibliographic DBs, in an attempt to shed light on five issues:

1. How much variability in the structure of Spanish names is there in each of these DBs, and what are the possible causes of this variability?
2. What are the consequences of this variability for information retrieval based on Spanish personal names?

Table 1
Possible structures of Spanish names and their frequency in the sample

Structures	Number	Percent
First name first surname second surname	91	52.9
First name middle name first surname second surname	53	30.9
First name p. middle name first surname second surname	8	4.7
First name first surname p. second surname third surname	3	1.8
First name middle name first surname p. second surname	2	1.3
First name first surname second surname p. third surname	2	1.3
First name p. first surname second surname	2	1.3
First name first surname-second surname third surname	2	1.3
First name middle name first surname second surname p. third surname	1	0.5
First name middle name first surname p. second surname third surname	1	0.5
First name p. middle name first surname p. second surname	1	0.5
First name first surname c. second surname	1	0.5
First name second name p. first surname second surname	1	0.5
First name p. a. first surname second surname	1	0.5
First name middle name p. a. first surname second surname-third surname	1	0.5
First name middle name first surname second surname-third surname	1	0.5
First name first surname second surname-third surname	1	0.5
Total	172	100.0

p. = preposition; c. = conjunction; a. = article.

3. How consistent are the DBs in their approach to indexing Spanish names?
4. How accurately are Spanish authors' names handled in Science Citation Index (SCI), MEDLINE, and Índice Médico Español (IME)?
5. What criteria can be used by the DBs to improve accuracy and consistency, and what practices can authors and journals use to improve consistency and reliability?

METHODS

Sample

From a reference population of Spanish authors indexed in SCI, MEDLINE, and IME during 1987 to 1996, we extracted a sample of 172 authors affiliated during this period with the School of Medicine at the University of Granada, Granada, Spain. The choice of a nonrandom sample was based on methodological reasons. We needed to check all variants of the same name indexed in the DBs against the author's full, correct name. This information would have been difficult and time consuming to obtain, if we had used a random sample of all Spanish university authors associated with items in these DBs. The following criteria were used to ensure that the sample was representative and unbiased and that the results could be assumed to have external validity:

1. The sample contained all possible name structures at proportions that represented their true frequency in Spain (Appendix). Table 1 shows the different name structures and their frequencies in our sample. The most frequent name structure in Spain consists of a first name (which may in turn consist of one or more parts; for the sake of convenience we have used the term ''middle name'' here to designate the second part of compound first names) and a patronymic surname followed by a matronymic surname. In our sample, the legal names of 83.8% of the authors reflected this structure (52.9% plus 30.9%).
2. The number of authors associated with more than one item was large enough to permit the study of possible variants in their name. Of the 172 authors in our sample, 162 (94%) had published more than one article (Appendix).
3. The number of authors indexed in more than one of the three DBs was large enough to permit comparisons across DBs. In our sample, 82.6% of the authors appeared in two of the DBs, and 63.4% appeared in all three (Table 2).
4. The sample was free of biases. Although a sample of authors from the same institution might have been biased by uniform publication practices, this possible bias was ruled out by the fact that the School of Medicine of the University of Granada has no institutional publication guidelines or recommendations. The results of the study also failed to reveal any uniform trends in publication.

Table 2
Number of authors in each database

Databases	Number of authors	Percent
In all three databases	109	63.4
Índice Médico Español (IME) and Science Citation Index (SCI)	8	4.7
IME and MEDLINE	16	9.3
SCI and MEDLINE	9	5.2
Subtotal (in less than one database)	142	82.6
In only one database	30	17.4
Total	172	100.0

We chose the DBs in this study to investigate whether variability in name structure was widespread or limited to certain DBs and to compare different repositories in terms of information retrievability when searches were based on author names. The three DBs in this study were also the most representative sources of bibliographic information in the biomedical research community in Spain, both for national (IME) and international coverage (SCI, MEDLINE). An exploratory analysis of the DBs that Spanish biomedical researchers used for literature searching showed that 62% used MEDLINE, whereas 19% used IME [39]. A recent study also noted the importance of SCI for the biomedical literature and the effectiveness of the joint use of this DB and MEDLINE by medical researchers to retrieve the largest possible number of references [40].

The IME, produced by the Centro de Documentación e Información Biomédica (Center for Biomedical Documentation and Information) at the University of Valencia and the Consejo Superior de Investigaciones Científicas (CSIC, Higher Council of Scientific Research) is the most accurate and complete national DB for tracking medical publications in Spain and for increasing the national and international dissemination of this research [41, 42].

MEDLINE is considered the best bibliographic information system in biomedicine and is the most widely used [43], although other DBs, such as EMBASE/Excerpta Medica, cover a larger number of journals [44]. In addition, MEDLINE has been used as a source of bibliometric information to study Spanish scientific production in biomedicine. According to Pestaña [45], during the period from 1990 to 1994, the number of articles by Spanish authors indexed in MEDLINE was double the number indexed in SCI. This difference is not surprising given that during that period MEDLINE indexed thirty-six Spanish journals, whereas SCI and the Social Science Citation Index (SSCI) together covered only twelve.

SCI is a unique bibliographic information system. It processes the references contained in each source document it indexes, thereby making it possible to retrieve all related documents through the references cited. It is therefore the only system that can be used to measure the dissemination and use of scientific information via citation analysis and is hence an indispensable tool for bibliometric studies.

Aside from the reasons given above, the three DBs were considered particularly useful in the present study because of the differences in the scope of their coverage (SCI indexes journals from all areas of science, whereas MEDLINE and IME cover only health sciences) and in the main languages of the source items (English in MEDLINE and SCI, Spanish in IME). These differences allowed us to compare the degree to which bibliographic authority control was conditioned by the main language of the DB.

Data collection

The full correct name of each author was taken from a list of medical school teaching staff generated by the personnel database maintained by the School of Medicine, University of Granada. All names on this list were considered potential authors. The procedure to identify publications associated with each author in each DB was as follows.

For SCI, we searched on the address field year by year from 1987 to 1996 to retrieve all records that included the word ''Granada.'' These records were examined one by one to collect only those items whose authors were affiliated with the School of Medicine at the University of Granada. This strategy was successful thanks to the detailed information in the affiliation field for each author of each item.

For IME and MEDLINE, the searches were done in a slightly different way, because these databases recorded address information only for the first author in the byline, and searches on the affiliation field would therefore not have been effective. We performed four searches for each name on the list of potential authors: (1) first and second surnames and first name initial, (2) first and second surnames, (3) first surname only and first name initial, and (4) second surname only and first name initial. For authors with complex names, we ran searches with all possible name structures (first surname only, second surname only, or both; one or more initials for first and middle names; particles; see Table 1). Each record thus retrieved was checked to ensure that the author's name was a variant of the target author's name, rather than a different individual with a similar name.

All records obtained with these search strategies were loaded into a ProCite database (v. 4.0) for further manipulation. The search and indexing functions of this program were used to identify all variants of each name in records from each of the three DBs. We tabulated the results (Appendix), and this information was used for further quantitative analyses for each author. For each author, we noted the full correct name in bold characters, then added the correct standard structure according to the current Spanish Cataloging Rules (RCE) [46] and the International Federation of Library Associations and Institutions (IFLA) guidelines [47]. All standard structures took the form of one of the two basic structures explained in Figure 1 or of one of the modifications.

The occurrences in each DB of each of the variants found for each author were identified. Variants were matched with their standard structure by searching for author entries with the same first name or names, first (and second, if given in the record) surname, and particle or particles, regardless of the order in which these components of the name appeared in the DB record. If the same variant was suspected to refer to two dif-

Figure 1
Uniform headings for Spanish personal names according to current Spanish Cataloging Rules

Basic structures (General rule)

First surname second surname, first name

Example: Aguilar Peña, David

First surname second surname, first name middle name

Example: Bermúdez García, José María

Particularities

1. *For some authors these two basic name structures can be augmented by a third surname. (Example: García Del Río Molina, Cipriano)*
2. The elements that form the author's name can be joined to, combined with, preceded by, or followed by one of the following: hyphen, conjunction, preposition, article, preposition + article, or contraction of a preposition + article. These particles are standardized in accordance with the following criteria for cataloging:
- A hyphen, conjunction, preposition, preposition + article, or contraction of a preposition + article (*-, y, de, de la, del*), which links parts of the surname, first name, or middle name is left as is (example: Luna Del Castillo, Juan De Dios).
- A single preposition, preposition followed by an article, contraction of a preposition + article, or contraction of a preposition + apostrophe (*de, de la, del, d'*) preceding the first surname is to be placed after the first name or after the middle name if both a first and middle name are present (example: Higuera Torres-Puchol, José Manuel De La).
- An article alone (i.e., not accompanied by a preposition)—separate from, joined by a hyphen, or combined with the first surname—is to appear at the beginning of the entry (examples: Las Heras, Manuel; Lafuente, Modesto; La-Fuente, Alvaro).
- If an article joined to or combined with the first surname is preceded by a preposition (as an independent element), the article is to appear at the beginning of the entry (example: La-Rosa, Agustín De).

ferent authors, the variant was assigned to the first name in the alphabetical listing of potential authors. Variants that were obviously the result of a typographical error or the omission of a hyphen from the surname were assigned to the appropriate author with little difficulty. After we resolved these particular cases, in a few cases, some doubt remained as to which author a variant heading belonged.

Absolute and relative frequency indices were calculated for each variant. Pearson's correlation coefficient was calculated to determine when variability in the author's name correlated with productivity.

RESULTS

Overall quantification of variability in author names

To judge the magnitude, in absolute and relative terms, of the problem with Spanish author names in the three DBs analyzed here, we ranked authors by the number of variants in the names under which each was indexed. Table 3 shows that about half of the authors appear under two or more variants in SCI (48.1%) and MEDLINE (50.7%) and that this proportion is an even higher 69.0% in IME. The most frequent total number of variants was between two and four. Five authors had five variants in MEDLINE, and two authors had five variants in IME. In each of these DBs, one author appeared under seven different variants.

Table 3
Distribution of different numbers of variants of author names in each database

	SCI		MEDLINE		IME	
Number of variants	Number of authors	Percent	Number of authors	Percent	Number of authors	Percent
One	67	51.9	69	49.3	48	31.0
Two	36	27.9	43	30.7	72	47.8
Three	22	17.1	13	9.3	17	11.4
Four	4	3.1	11	7.9	11	7.5
Five	0	—	3	2.1	2	1.5
Six	0	—	0	—	0	—
Seven	0	—	1	0.7	1	0.8
Total two to seven	62	48.1	71	50.7	103	69.0
Total	129	100.0	140	100.0	151	100.0

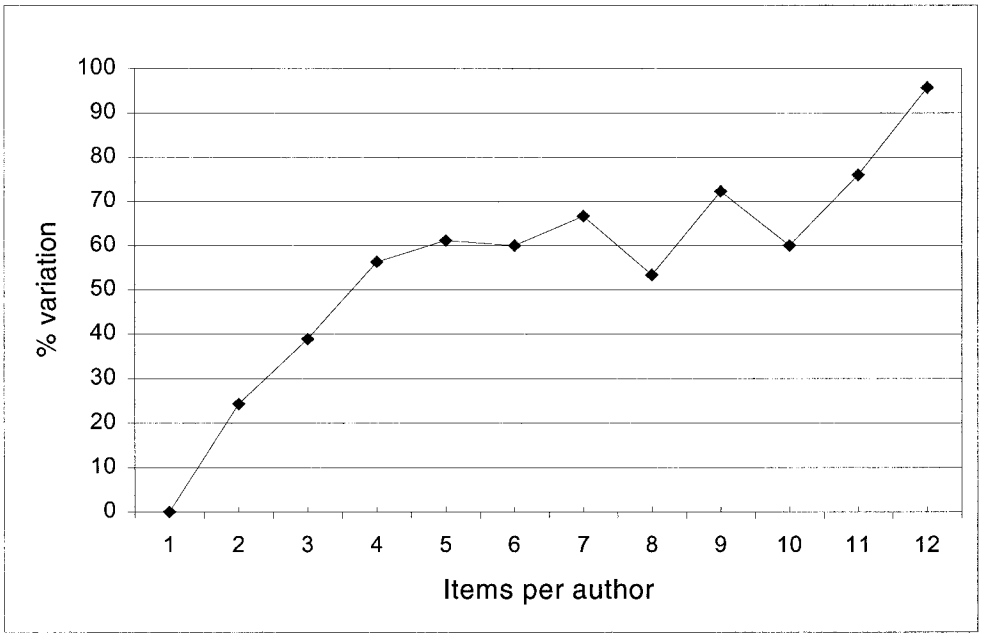
Relationship between productivity and variability

To obtain a more detailed vision of the problem, we analyzed the relationship between variability in author names and productivity. For authors with only one publication, variability is zero. As the number of publications increased, so did the number of variants under which authors were indexed (Figure 2). The correlation between these variables was significant: among authors with two or three publications, 25% to 40% appeared under more than one name. Among those with five to ten publications (approximately the median number for our sample), more than 50% were indexed under more than one name. For example, among those with nine items in the DBs, more than 70% were indexed under several different names. For highly productive authors with more than ten publications, it was exceptional for any name to appear systematically with the same structure in all records, in other words, almost 100% of those in this subgroup were indexed under several different names.

When the results for different DBs were examined separately (Figure 3), we again found that as the number of publications increased, the percentage of authors with no variants decreased. Uniformity in the structure of the names within the same DB was lost.

The implication of increased productivity for the retrievability of information was that as the number of publications increased, the effectiveness of searches on the author field diminished. In other words, the number of items likely to be located by a search with any of the possible variants for author name tended to decrease. This problem affected 50% of the authors with

Figure 2
Correlation between variability in author name and productivity



more than one item in SCI and 70% of all such authors in IME. Of all potentially locatable articles by a given author, between 50% and 70% of the records used some variant of the author's name. This inconsistency was especially notable in IME and was less marked in MEDLINE. In the latter DB, the decrease in the number of articles that a search on any variant was likely to locate was exponential; this relationship was less marked than in SCI or IME.

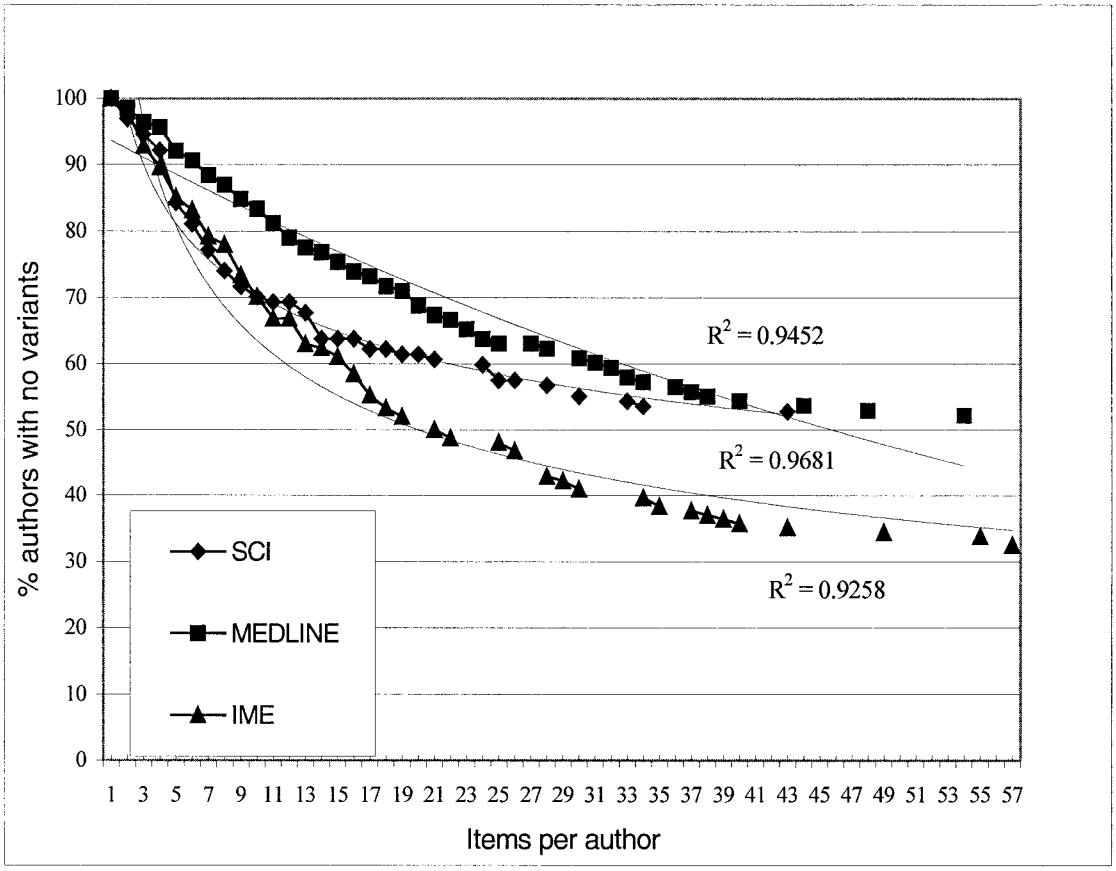
A separate study of each DB revealed other phenomena that deserved comment and were most noticeable in SCI. Figure 4 plots the percentage of authors with no variants against productivity. In the interval between two and five publications, the loss of uniformity was already notable: among authors associated with five items, only 20% appeared under the same name in all records. However, among highly productive authors with more than ten publications, two groups were clearly distinguishable: those with extremely high variability to the extent that a different variant appears for each publication, those with no variability, and those whose name appears in the same manner in all records.

Types and frequencies of variants

The frequencies of different name structures were counted to determine which variants were used most often in the DBs and to compare the three DBs in terms of accuracy and degree of variability. Table 4 shows the most frequent variants used for indexing in the different DBs. In MEDLINE and IME, the structure used most often was ''first surname second surname, first name initial'' (for example, Galvez Vargas, R), which accounted for 32.9% and 36.7% of the index entries, respectively. The second-most frequent structure was ''first surname, first name initial'' (for example, Galvez, R) at 25.2% and 21.5%, and the third-most often used was ''first surname, first name initial middle name initial'' (for example, Caballero, AM) at 12.7% and 9.2%. In fourth place in MEDLINE and IME records was the structure ''first surname second surname, first name initial middle name initial'' (for example, Caballero Plasencia, AM) with 8.8% and 12.8% of all entries, respectively.

However, the situation in SCI was clearly different. The name structure that accounted for the largest proportion of entries (35.8%) was ''first surname, first name initial'' (for example, Galvez, R). The second-most frequent structure (18.3%) was a single string of characters consisting of the first surname run in with the second surname, followed by the first name initial (for example, Galvezvargas, R). The third-most common structure, accounting for 12.2% of the entries in SCI, was ''first surname, first name initial middle name initial'' (for example, Caballero, AM), and the fourth most common structure (7.1%) was ''second surname, first name initial first surname initial'' (for example, Vargas, RG for the author named Ramon

Figure 3
Correlation between number of variants and productivity in each database



[first name] Galvez [first surname] Vargas [second surname]).

In all three DBs, the remaining variants each accounted for less than 5% of the entries, and many variants in name structure occurred only one or two times each.

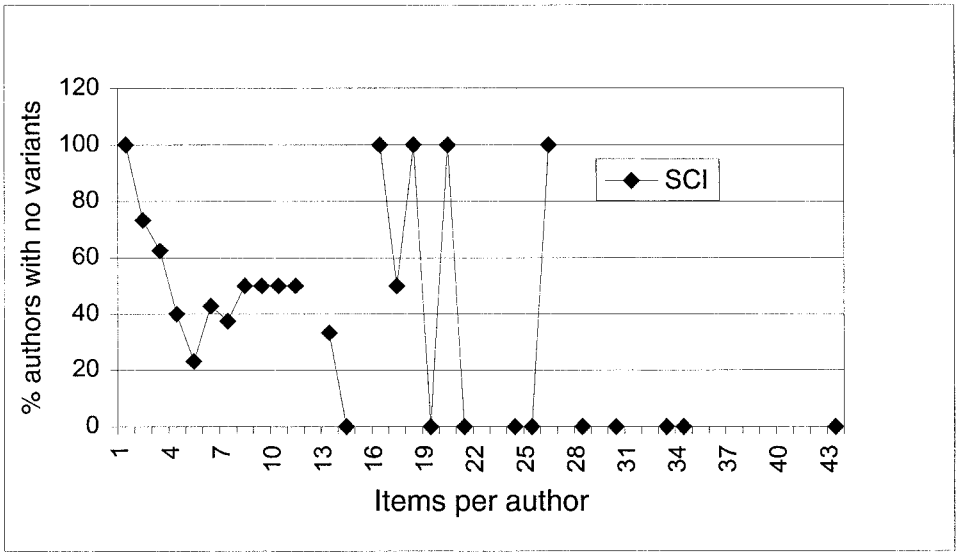
DISCUSSION

The large proportion of authors whose name appears in more than one manner and the direct correlation between productivity and variability suggest that the origin of the problem is in the lack of consistency on the part of authors themselves in signing their research articles. This behavior leads to serious inconsistencies in the DBs, whose managers and technicians apparently do nothing to curtail or correct the problem.

One of the principles used to improve the quality of bibliographic databases is to establish a single structure for each name that appears associated with different source documents. Our findings strongly suggest that the DBs we sampled do not apply any type of control measure to keep variants of the same name from proliferating. As a result, the quality of information retrieval based on searches by author is poor. The consequences for users of these DBs are clear: if users wish to locate all items published by a certain author by searching on the author field, they must perform at least two separate searches for half of the authors (at least, for the population of authors affiliated with the University of Granada medical school) and often many more, depending on how many variants there are of the authors' names. With browsing techniques, users would need to discover by trial and error which variants have been used for entries, among the many possible combinations (some clearly incorrect and unlikely to be guessed by a typical DB user) of first and second surnames and first and middle name initials.

We were surprised to find the highest rate of variability in the Spanish database, IME. In theory, familiarity with Spanish name structures on the part of the persons who manage this DB should have led to less variability in IME than in the two international DBs

Figure 4
Relation between number of variants and productivity in SCI



created and managed in the United States. The withdrawal in 1990 of the public funding on which IME depended for its maintenance and day-to-day operations may explain the drop in the quality of bibliographic control and may account for the poor performance we observed for items published between 1987 and 1996. In addition, IME enters information into its records just as it appears in the source documents and produces indexes only of Spanish publications. This process may be construed as evidence that Spanish authors—at least those who publish in biomedicine—are less careful about using the same name for all their publications when they submit articles to Spanish journals than when they submit them to ''international'' journals. Studies designed to investigate authors' behavior in signing different articles will be needed to shed light on this hypothesis.

Our analysis of the relationship between productivity and variability revealed a direct correlation between these two variables. In MEDLINE, the increase in variants as a given author published more items was less than in the other two DBs, a finding that might be related to the use of measures to control author names or at least to invert the order of first names and surnames correctly to respect the original name structure in Spanish.

Hence, greater productivity implies lower effectiveness of information retrieval, with a tendency for the number of items theoretically retrievable to approach one for highly productive authors. The consequences of this tendency are obvious: as an author produces more publications, the likelihood that all of them will be located by a single search with a single variant of the author's name—regardless of whether the variant tried is the correct one according to Spanish language usage or one of the several possible incorrect permutations—decreases sharply, as illustrated in Figure 2.

For comparatively unproductive authors who have published only a few articles or perhaps only one, retrievability is better, but only if the search or browsing session is based on the same name structure used to index the item or items in the DB. Regardless of their productivity, then, this means that even for Spanish authors indexed by only one name—which may or may not be correct according to Spanish usage—retrievability cannot be assured. As several studies have already pointed out [48–50], information retrieval based on searching by author name will become optimal only when authority control measures are used to standardize entries, ensure their consistency across records (unification), and guarantee that ''see'' and ''see also'' cross-references are appropriately linked.

Despite the trend toward loss of reliability in retrieval as the number of publications increases, Figure 4, which is based on results obtained with SCI, shows that high productivity is not always associated with high variability in author name structures. Some authors have standardized their name structures throughout their publishing career by signing all their articles with the same ''pen name.'' (For some examples, see authors 11, 60, 116, and 167 in the appendix.) These authors, along with those for whom only one item is indexed, account for the subgroup of authors with no variants. At the opposite extreme are authors with complex names who have not adopted a permanent pen name; under these circumstances many

Table 4
Frequency of different variants in each database

Variant	SCI			MEDLINE			IME		
	Number of entries for the variant	Percent	Number of authors with variant	Number of entries for the variant	Percent	Number of authors with variant	Number of entries for the variant	Percent	Number of authors with variant
First surname second surname, name initial	2	0.19	1	507	32.9	64	665	36.7	77
First surname, name initial	380	35.8	64	389	25.2	53	390	21.5	68
First surname, first name initial middle name initial	130	12.2	27	195	12.7	27	165	9.2	28
First surname second surname, first name initial middle name initial	0	—	0	135	8.8	32	234	12.8	38
First surname, first name initial	65	6.1	13	80	5.2	12	66	3.6	15
First surname, middle name initial	40	3.8	7	39	2.5	10	22	1.3	7
First surname p. second surname, name initial	0	—	0	36	2.3	3	27	1.5	2
First surname second surname, first name initial	0	—	0	26	1.7	9	106	5.8	15
First surname p. second surname, first name initial middle name initial	0	—	0	22	1.4	3	37	2.2	4
First surname, second surname initial name initial	20	1.9	1	21	1.4	1	5	0.3	2
First surname second surname, name initial	193	18.3	36	19	1.2	2	0	—	0
Second surname, name initial first surname initial	76	7.1	30	1	0.1	1	5	0.3	2
p. second surname, name initial first surname initial	48	4.5	2	2	0.1	2	0	—	0
First surname secondsurname, first name initial middle name initial	45	4.2	15	0	—	0	0	—	0
Second surname, first name initial middle name initial first surname initial	21	1.9	9	0	—	0	0	—	0
p. second surname, first name initial middle name initial first surname initial	15	1.5	1	0	—	0	0	—	0
Other	28	2.6	14	69	4.5	26	90	4.8	33
Total	1,063	100.0	220	1,541	100.0	245	1,812	100.0	291

p. = preposition; c. = conjunction.

variants can arise. (For examples, see authors 18, 56, 68, 77, 85, and 149 in the appendix.) Interestingly, some highly productive authors in the present sample appear to have used a pen name more systematically for some journal submissions than for others. This transitory consistency is reflected in the numbers of variants found in SCI for some cases. (For examples, see authors 20, 92, 128, 132, 150, and 172 in the appendix.) This may reflect the fact that most source items indexed by SCI are from journals published in English-speaking countries, and many journals may impose English-language conventions on the structure of foreign authors' names. In any case, it appears that some Spanish authors with publications in international journals consider the country where the journal is published when they place their name on the title page of the manuscript.

An analysis of the most frequent variants in each DB suggests some answers to some of the questions raised above. In overall terms, four main variants account for a large percentage of occurrences of author names (Table 4). These four variants are all derived from the two name structures that are currently the most common in Spain and that together represent the full legal names of 83.7% of the authors in our sample (Table 1). However, to understand these data, it is necessary to backtrack and deduce how these variants came about as a result of the indexing rules or criteria used by each DB.

In IME and MEDLINE, the most frequent and fourth-most frequent variants are the correct, standardized forms of authors names according to national (RCE) and international (IFLA) cataloging rules, the only departure from these guidelines is that in both cases initials are used for the first and middle names. IME uses the RCE criteria (summarized in Figure 1), and MEDLINE, produced by the National Library of Medicine (NLM), uses the NLM Cataloging System [51]. This latter system is compliant with the Program for Cooperative Cataloging (PCC) developed by the Library of Congress and the Name Authority Cooperative Organization (NACO) [52], whose base standards are the criteria established by the second edition of the Anglo-American Cataloging Rules (AACR2) [53] for the formation of headings for persons and the specifications of the MARC format for type of personal name entry element [54].

The second-most and third-most frequently seen variants in IME and MEDLINE, as well as the remaining variants shown in Table 4, can be derived from the base standards cited above, although these variants do not represent correct names. We can therefore deduce that the indexing criteria used by IME and MEDLINE follow Spanish linguistic practices, although they seemingly fail to apply mechanisms such as checking against an authority file to ensure that the same form of the author's name is indexed consistently and con-

tinuously throughout the life of the DB. Such systematization measures would greatly improve the retrievability of information by ensuring that all works linked to the same author are located in a single search.

In SCI, however, the most frequent variants are the result of the application of a specific indexing criteria used by this DB: ''the general rule is that the final name presented is taken as the surname—this applies to all languages. All other names presented are processed as initials'' [55]. This general rule is compatible with the basic criterion of the AACR2 for the standard structure (name and surname) of names in English. On the basis of this general rule, ISI always considers the last part of the name given in the source document to be the only indexable surname for that author and thus uses this part as the entry element. The remaining parts of the name are reduced to initials; for example, José María Bermúdez García becomes García, JMB. The system used by ISI uses one exception for all languages: particles that link the first name with the surname are treated as part of the surname: ''Particles are included as part of the surname. There is a list of accepted particles that is applied to all languages'' [56]. For example, Juan Luis del Arbol becomes Delarbol, JL. A specific rule used by SCI for Spanish names further confirms that these names are often mutilated by their indexing policy: ''Compound names joined by 'y' or 'e' are split so that the last name presented is processed as the surname, and the conjunction is taken as an initial'' [57]. For example, María González y Rodriguez becomes Rodriguez, MGY.

According to these indexing criteria, and considering that the most common structure of Spanish names is ''first name (middle name if present) first surname second surname,'' the most common variants in SCI would be expected to be ''second surname, first name initial first surname initial'' (e.g., Angeles Ruiz Extremera becomes Extremera, AR) and second surname, first name initial (middle name initial) first surname initial (e.g., María Estrella Ruiz Requena would be expected to be indexed in SCI as Requena, MER). However, these variants actually occupy the fourth and sixth positions in descending order of frequency.

We found that the variants produced by authors who presumably adapted their pen name to English-language conventions were more frequent in this DB than the ''standard'' entry structure derived from applying SCI's indexing criteria to Spanish names published according to normal Spanish-language conventions. For example, authors whose name appeared as ''first name first surname'' were indexed under entries structured as ''first surname, first name initial,'' the most frequent variant in SCI. Authors who signed their articles as ''first name middle name first surname'' accordingly were indexed under ''first surname, first name initial middle name initial''—the third most frequent variant in SCI. If authors joined their two surnames with a hyphen (first name, first surname-second surname), they were indexed as first surname run together with second surname, first name initial—the second most frequent variant in SCI.

Why are these variants found in SCI but not in MEDLINE? Both DBs are produced in the United States and may be assumed to adapt Spanish names in a similar manner. The explanation may lie in the fact that most of the items by Spanish authors in MEDLINE (about 70%) are from the thirty-four Spanish journals that this DB indexes, whereas nearly all items by Spanish authors in SCI are from journals published in English-speaking countries. This difference appears to be the result of two factors. First, author names in MEDLINE are spared any attempt to adapt them to English linguistic conventions and are indexed correctly. Second, for articles in journals covered in SCI, authors may have been more careful to adapt their names to English linguistic conventions, either spontaneously or to comply with the journal's instructions to authors.

CONCLUSIONS

Causes of variability

Although the data we obtained for author name variants should be verified against the way authors' names appear in the source documents, the present results have important implications, discussed below.

We suggest several main causes of variability in author name index entries in the three DBs we compared. One cause is likely to originate with the authors themselves, who may sign different articles in different ways. We have found that variability tends to increase with productivity. Another cause is the difference in indexing procedures at different DBs—even though the indexing mechanisms are apparently applied consistently within each DB. The procedures used by MEDLINE and IME are appropriate for Spanish names and respect Spanish language conventions, whereas those used by SCI clearly violate these conventions by imposing English name structures. Despite the consistency in the rules developed and applied by each DB, the lack of effective authority control measures means that variants created by the authors themselves are not corrected. Indexing procedures that are inappropriate for Spanish names multiply the effect of inconsistency on the part of the authors. A minority of authors, aware of the problems their names cause in international bibliographic DBs (possibly due to style manuals or the instructions to authors provided by some journals), take measures to counteract the proliferation of variants, although these preventive measures have little effect on the overall accuracy of Spanish author entries in the DB.

Recommendations to reduce variability

To avert the problem at its origin, recommendations need to be aimed at authors and journals. In contrast, attempts to correct the problem during the final phase of information transfer, while the DB record is being prepared or after the source document has been indexed in the DB, should be aimed at DB managers and users.

Authors should be encouraged to sign their articles with the same pen name throughout their publishing careers. Our findings suggest that the structures most likely to reduce variability in Spanish names to a minimum in international DBs are ''first name first surname'' and ''first name middle name first surname.'' In other words, the pen name should imitate English language conventions and, if possible, omit particles. Speaking realistically, it seems unlikely that SCI and other large DBs will change their indexing rules in the near future to accommodate the linguistic conventions of Spanish or other languages that differ from English in the way personal names are given. Whether the first and middle names are given in full or as initials would not affect the structure of the DB entry, as all three DBs studied here reduce these names to initials.

This suggestion, however, raises some sensitive issues. First, it assumes that no solution is to be expected from the DBs themselves. Second, Spanish authors may be little inclined to amputate or otherwise mutilate their legal names, a behavior that may well involve some trauma to their linguistic identity. Third, the use of the first name only (with no middle name) and the first surname only would increase problems of homonymia caused by several authors sharing the same pen name, and confusion would be further increased by the use of the initial only for the first name in the index entry and consequent loss of information on the author's first name. This problem has been pointed out in some style manuals and has been discussed in depth by Silva [58]. Assuming that DBs may one day attempt to palliate the problem of homonymia, it seems advisable for authors to provide first and middle names in full in their manuscripts.

Another solution that some authors have resorted to is to join the two surnames with a hyphen so that they are treated as a single indexing element. This hyphenation may more effectively reduce the problems with author identification, particularly in SCI. However, because this DB removes hyphens and combines the surnames, it creates an indexing term that is entirely inaccurate for Spanish authors, as the spurious surname thus created is no longer the author's real surname. For example, Francisco Pérez-Blanco becomes Pérezblanco, F in SCI. Combining the two surnames is not necessary in MEDLINE, because its indexing mechanism leaves the original structure of Spanish names unaltered.

Journals can also do their part to standardize elements used in the process of information transfer. Editorial staff could take measures to ensure that authors appear consistently under the same name in the published byline. They could also take steps to ensure that an author's name appears in the same way in all parts of an issue (i.e., in the table of contents as well as in the article byline) and in the summaries and indexes. The journal's instructions to authors could require specifically that authors take special care to use the same pen name consistently for all their manuscripts.

Because the databases process such huge amounts of information, it seems unlikely that they would be willing or able to play a part in solving the problem of variability and inconsistency in author entries, although these problems undermine their usefulness as information-retrieval tools. This, however, does not exempt them from taking responsibility for their share of the problem. The three DBs we compare in this study should consider applying control procedures that would ensure that a given author is consistently indexed under the same name. SCI should adapt its indexing procedures to the different conventions of languages other than English. The use of indexing rules based on English linguistic conventions for authors from all countries results in the systematic distortion of non-English names.

Meanwhile, to increase the efficacy of information-retrieval processes and improve the accuracy of bibliometric analyses, DB users should take some precautions. For Spanish authors who may be indexed under more than one name, Table 4 provides a list of most possible variants that should be used in a search. Based on the most frequent name structure for Spanish authors (''first name middle name first surname second surname''), searches for items associated with the author Antonio María Caballero Plasencia should be run for the potential variants Caballero Plasencia A, Caballero A, Caballero AM, Caballero Plasencia AM, and Caballero M in MEDLINE and IME and for the potential variants Caballero A, Caballero AM, Caballeroplasencia A, Caballeroplasencia AM, and Plasencia AMC in SCI. Ideally, these variants should be tried in the order in which they are given here. Search strategies based on these recommendations can be assumed to retrieve about 85% of all items associated with a given author. As searching continues with the minority variants listed in Table 4, the proportion of potential items associated with the author will approach 100%.

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APPENDIX

Full correct name, standard structure, and frequency of different variants that appeared during the ten-year period from 1987 to 1996 in each database for each author affiliated with the School of Medicine, University of Granada

Full correct name Standard structure Variants	Índice Médico Español	Science Citation Index	MEDLINE
1. Federico Luis Acosta González			
Acosta González, Federico Luis			
Acosta Gonzalez, F	5		1
Acosta Gonzalez, F L	4		
2. Dario Acuña Castroviejo			
Acuña Castroviejo, Darío			
Acuña Castroviejo, D	1		18
Acuña, D	3		3
Acunacastroviejo, D.		18	
Castroviejo, D.A.		7	
3. David Aguilar Peña			
Aguilar Peña, David			
Aguilar, D	4	14	15
Aguilar PeñA, D	6		5
Aguilarpena, D.		1	
Pena, D.A.		4	
4. Mariano Aguilar Peña			
Aguilar Peña, Mariano			
Aguilar, M.		1	3
Aguilarpena, M.		1	
Pena, M.A.		3	
5. Luis Álvarez Guisado			
Álvarez Guisado, Luis			
Alvarez, L	5	24	24
Alvarezguisado, L.		1	
Alvarez Guisado, L.			1
6. Antonia Aránega Jiménez			
Aránega Jiménez, Antonia			
Aranega, A	3	31	28
Aranegajimenez, A.		1	
Aranega Jimenez, A.			1
7. Antonia Emelia Aránega Jiménez			
Aránega Jiménez, Antonia Emelia			
Aranegajimenez, A.E.		1	
Aranega, A. E.			18
Aranega Jimenez, A. E.			1
8. Juan Luis Del Árbol Navarro			
Árbol Navarro, Juan Luis Del			
Arbol, J L Del	5		
Arbol Navarro, J L	1		1
Arbol Navarro, J L Del	1		
Delarbol, J.L.		3	
del Arbol, J. L.			6
del Arbol Navarro, J. L.			1
9. Ignacio María Arcelus Imaz			
Arcelus Imaz, Ignacio María			
Arcelus, I.M.		1	
Arcelusimaz, I.M.		1	
10. Francisco Arrebola Nacle			
Arrebola Nacle, Francisco			
Arrebola, F	1	2	
Arrebola Nacle, F	3		
11. José Manuel Baeyens Cabrera			
Baeyens Cabrera, José Manuel			

Full correct name Standard structure Variants	Índice Médico Español	Science Citation Index	MEDLINE
Baeyens, J M	12	16	28
12. Rogelio Bayes García			
Bayes García, Rogelio			
Bayes Garcia, R	10		10
Bayes, R	11	1	1
13. Jose María Bermúdez García			
Bermúdez García, Jose María			
Bermudez Garcia, J M	9		6
Bermudes Garcia, J M†	1		
Garcia, J.M.B.		1	
14. Maria Del Carmen Bernal Zamora			
Bernal Zamora, Maria Del Carmen			
Bernal, C	1	3	2
Bernal, M	1		1
Bernal, M C	16	11	16
Bernal Zamora, M C	3		2
15. Agustín Buendía Eísman			
Buendía Eísman, Agustín			
Buendia Eisman, A	2		
Buendia Elsman, A†	1		
16. Aurora Bueno Cavanillas			
Bueno Cavanillas, Aurora			
Bueno, A	2	2	3
Bueno Cavanillas, A	15		19
Buenocavanillas, A.		6	
Cavanillas, A.B.		6	
17. Trinidad Caballero Morales			
Caballero Morales, Trinidad			
Caballero Morales, T	5		3
Caballero, T	1	12	9
Morales, T.C.		2	
18. Antonio María Caballero Plasencia			
Caballero Plasencia, Antonio María			
Caballero, A	2		3
Caballero, A M	3	1	1
Caballero Plasencia	1		
Caballero Plasencia, A M	16		16
Caballero Plasencia, M	6		4
Caballeroplasencia, A.M.		2	
Cabelleroplasencia, A.M.†		1	
Plasencia, A.M.C.		2	
19. Miguel Cámara Pulido			
Cámara Pulido, Miguel			
Camara, M	6	6	10
Camara Pulido, M	4		1
20. Antonio Jesús Campos Muñoz			
Campos Muñoz, Antonio Jesús			
Campos, A	15	18	28
Campos MuñOz, A	4		2
21. María Del Mar Campos Pastor			
Campos Pastor, María Del Mar			
Campos, M M	3	2	
Campos Pastor, M M	6		4
Campos, M.		1	
Campospastor, M.M.		4	
Pastor, M.M.C.		1	
22. Cristina Campoy Folgoso			
Campoy Folgoso, Cristina			
Campoy, C	3	1	
Campoy Folgoso, C	5		5
23. Francisco Javier Cañízares García			
Cañízares García, Francisco Javier			
CañIzares, F J	4	7	12
CañIzares Garcia, J	1		1
CañIzares, J	1		1
24. Octavio Carazo Martínez De Anguita			
Carazo Martínez De Anguita, Octavio			
Carazo Martinez De Anguita, O	1		
Carazo Martinez, O	1		1
Carazo, O	1		
Martinez, O.C.		1	
25. Raimundo Carlos Y García			
Carlos Y García, Raimundo			
Carlos Garcia, R	1		1
Carlos, R	9	2	4
26. Asunción Carmona Marinetto			
Carmona Marinetto, Asunción			
Carmona, M	3		
Carmona, M A	2		
Carmona Marinetto, A	4		2
27. Buenaventura Carreras Egaña			
Carreras Egaña, Buenaventura			
Carreras, B	2	1	3
Carreras EgañA, B	1		
28. Francisco Javier Carreras Egaña			
Carreras Egaña, Francisco Javier			
Carreras EgañA, F J	1		
Carreras, F J	4	5	3
29. Ignacio Carreras Egaña			
Carreras Egaña, Ignacio			
Carreras, I.		1	1
30. Manuel Castillo Garzón			
Castillo Garzón, Manuel			
Castillo, M	3	5	11
31. Ana María Castillo Pérez			
Castillo Pérez, Ana María			
Castillo Perez, A	2		
Castillo Perez, A M	1		1
Castillo, A	2	7	7
Castillo, A M	3	3	5
32. Sebastián Cerezo Morales			
Cerezo Morales, Sebastián			
Cerezo Morales, S	3		
Cerezo, S	13	23	1
Morales, S.C.		1	
33. Cesar Chung Serrano,			
Chung Serrano, Cesar			
Chung, C	5		
Chung Serrano, C	6		
34. Miguel Ciges Juan			
Ciges Juan, Miguel			
Ciges Juan, M	1	2	
Ciges, M	3	3	10
35. José Luis Cuadros López			
Cuadros López, José Luis			
Cuadros, J	1		
Cuadros, J L	23	1	1
Cuadros Lopez, J L	13		
36. María Angustias Cubero Sánchez			
Cubero Sánchez, María Angustias			
Cubero, M	1		

† Mistyped variants.

Full correct name Standard structure Variants	Índice Médico Español	Science Citation Index	MEDLINE
Cubero, M A	4		
37. Vicente Delgado Florencio			
Delgado Florencio, Vicente			
Delgado Florencio, V	18		1
Delgado, V	1	1	1
Delgadoflorencio, V.		1	
Florencio, V.D.		1	
38. Antonia Delgado Rodríguez			
Delgado Rodríguez, Antonia			
Delgado, A.		1	1
Delgado Rodriguez	1		
Delgado Rodriguez, A	3		
Delgadorodriguez, M.*		19	
39. Antonio Díez Ruiz			
Díez Ruiz, Antonio			
Diez, A	1		
Diez Ruiz, A	6		16
Diezruiz, A.		5	
Ruiz, A.D.		2	
40. Felipe De Dulanto Escofet			
Dulanto Escofet, Felipe De			
Dulanto Escofet, F De	1		
de Dulanto Escofet, F.			1
41. Fernando Escobar Jiménez			
Escobar Jiménez, Fernando			
Escobar, F	8	2	5
Escobar Jimenez, F	48		29
Escobarjimenez, F.		30	
Jimenez, F.E.		2	
Escobar Jimenez, F. E.			1
Escobar Jiminez, F.†			1
42. Joaquín De La Espín Ferrá			
Espín Ferrá, Joaquín De La			
Espin Ferra, J	1		9
Espinferra, J.		6	
43. Francisco Fernández Cervilla			
Fernández Cervilla, Francisco			
Fernandez Cervilla, F	1		2
Fernandezcervilla, F.		1	
Fernandez Cervilla, J. F.*			1
Fernandez, F.			2
44. Francisco Javier Fernández Mena			
Fernández Mena, Francisco Javier			
Fernandez Mena, J	3		3
Fernandez Mena, V. J.*			1
Fernandez Mena, F. J.			1
45. Eduardo Fernández Segura			
Fernández Segura, Eduardo			
Fernandez Segura, E	5		6
Fernandez, E.		2	1
Fernandezsegura, E.		7	
46. Blanca Fernández-Capel Baños			
Fernández-Capel Baños, Blanca			
Fernandez Capel, B	1		
Fernandez, B.		10	
47. Gabriel Galdo Muñoz			
Galdo Muñoz, Gabriel			
Galdo, G	4	1	
Galdo MuñOs, G†	2		
Galdo MuñOz, G	7		1
48. Ramón Gálvez Vargas			
Gálvez Vargas, Ramón			
Galvez, R	5	4	6
Galvez Vargas, R	37		45
Galvesvargas, R.†		1	
Galvezvargas, R.		9	
Vargas, R.G.		7	
Galvez Vargas, R. G.*			1
Galves Vargas, R.†			1
49. Carmen Jesus García García			
García García, Carmen Jesus			
Garcia Garcia, C	1		1
50. Juan De Dios García García			
García García, Juan De Dios			
Garciagarcia, J.D.		6	
Garcia Garcia, J. D.			7
51. José María García Gil			
García Gil, José María			
Garcia Gil, J M	12		2
Garcia, J	1		
Garcia, J.M.		7	8
Gil, J.M.G.		2	
52. Jose Manuel García López			
García López, Jose Manuel			
Garcialopez, J.M.		1	
Garcia Lopez, J. M.			2
53. Manuel García Morillas			
García Morillas, Manuel			
Garcia, M	2		
Garcia Morillas, M	8		5
Morillas, M.G.		2	
54. José Luis García Puche			
García Puche, José Luis			
Garcia Puche, J L	29		5
Garcia, J L	4	1	
Garciapuche, J.L.		1	
55. Jose Luis García Salmerón			
García Salmerón, Jose Luis			
Garcia Salmeron, J L	3		1
Garciasalmeron, J.L.		1	
56. Raimundo García Del Moral Garrido			
García Del Moral Garrido, Raimundo			
Garcia Del Moral-Garrido, R	3		1
Garcia Del Moral, R	19		25
Garciadelmoral, R.		1	
Delmoral, R.		1	
Delmoral, R.G.		42	
Garcia de Moral, R.†			1
del Moral, R.			4
Del Moral, R. G.			2
57. Cipriano García Del Río Molina			
García Del Río Molina, Cipriano			
Garcia Del Rio	1		
Garcia Del Rio, C	8		10
Garcia, C.		3	
Delrio, C.G.		6	
58. Juan Antonio Gázquez Evangelista			
Gázquez Evangelista, Juan Antonio			
Gazquez Evangelista, J A	4		
59. Blas Gil Extremera			
Gil Extremera, Blas			
Gil, B	1		

* Doubtful variants for this author.

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Gil Extremera, B	27		31
Gilextremera, B.		3	
Extremera, B.G.		5	1
60. Eloy Gilera López			
Gilera López, Eloy			
Girela, E	1	8	8
61. José Antonio Gómez Capilla			
Gómez Capilla, José Antonio			
Gomez Capilla, J. A.			2
62. Francisco Javier Gómez Jiménez			
Gómez Jiménez, Francisco Javier			
Gomez Jimenez, F	1		
Gomez Jimenez, F J	4		2
63. Mercedes Gómez Morales			
Gómez Morales, Mercedes			
Gomez Morales, M	17		25
Gomez, M	8	7	6
Gomezmorales, M.		14	
Morales, M.G.		9	
64. Jorge Luis González Calvín			
González Calvín, Jorge Luis			
Gonzalez Calvin, J	1		3
Gonzalez Calvin, J L	2		2
Gonzalez, J.		1	3
Gonzalezcalvin, J.L		3	
Calvin, J.G.		1	
Gonzalez Calin, J.L.†			1
65. Francisco González Gómez			
González Gómez, Francisco			
Gonzalez Gomez, F	44		7
Gonzalez, F	13		1
Gonzalez, F.J.*		7	
Gonzalezgomez, F.		6	
66. Amalia González Jiménez			
González Jiménez, Amalia			
Gonzalez Jimenez, A	14		4
Gonzalez, A	4	5	6
Jimenez, A.G.		1	
67. María Victoria González Méndez			
González Méndez, María Victoria			
Gonzalez Mendez, M V	2		1
Gonzalez, M			2
68. José Antonio Guerrero Fernández-Marcote			
Guerrero Fernández-Marcote, José Antonio			
Guerrero Fernandez, J A	1		2
Guerrero Fernandez-Marcote, A J	1		1
Guerrero Fernandez-Marcote, J A	11		6
Guerrero, J A	4	3	9
Guerreroferndez, J.A.		1	
Guerero, J. A.†			1
69. Miguel Guirao Pérez			
Guirao Pérez, Miguel			
Guirao, M	1		
70. Miguel Guirao Piñeyro			
Guirao Piñeyro, Miguel			
Guirao PiñEyro, M	2		
Guiraopineyro, M.		2	
71. Manuel Gurpegui Fernández De Legaria			
Gurpegui Fernández De Legaria, Manuel			
Gurpegui Fernandez De Legaria, M	1		
Gurpegui, M	5		
72. Maria Teresa Gutiérrez Salmerón			
Gutiérrez Salmerón, Maria Teresa			
Gutierrez, M T	2		
Gutierrez Salmeron, M T	16		2
Salmeron, M.T.G.		1	
Gutierrez, M.			1
73. Claudio Hernández Cueto			
Hernández Cueto, Claudio			
Hernandez, C	1		
Hernandez Cueto, C	3		12
Hernandezcueto, C.		6	
Hernadez Cueto, C.†			1
74. Antonio Francisco Hernández Jerez			
Hernández Jerez, Antonio Francisco			
Hernandez, A F	3	12	14
Hernandez, A.		1	
Hernandez, F.		1	1
75. José Hernández Quero			
Hernández Quero, José			
Hernandez, J	4	1	
Hernandez Quero, J	7		7
Hernandezquero, J.		7	
Quero, J.H.		3	
76. Luis Manuel Herrero Mateo			
Herrero Mateo, Luis Manuel			
Herrero Mateo, L	1		
Herrero Mateo, L M	2		
77. José Manuel De La Higuera Torres-Puchol			
Higuera Torres-Puchol, José Manuel De La			
Higuera, J De La	1		
Higuera, J M	1		
Higuera Torres-Puchol, J De La	2		
Higuera Torres-Puchol, J M De La	3		
Torrespuchol, J.M.H.		2	
Delahiguera, J.		1	
de la Higuera, J.			2
de La Higuera, J. M.			1
de la Higuera Torres Puchol, J.			1
Higuera Torres Puchol, J.M.			2
78. María Concepción Iribar Ibabe			
Iribar Ibabe, María Concepción			
Iribar, C	3	3	5
79. Dolores Jurado Chacón			
Jurado Chacón, Dolores			
Jurado Chacon, D	3		2
Chacon, D.J.		1	
80. José Liébana Ureña			
Liébana Ureña, José			
Liebana, J	9	10	16
Liebana UreñA, J	4		2
81. Juan José Linares Solano			
Linares Solano, Juan José			
Linares, J	12	5	5
Linares Solano, J	24		2
82. José Antonio Lobón Hernández			
Lobón Hernández, José Antonio			
Lobon Hernandez, J A	9		2
Lobon, J A	8	1	3
83. José María López Sánchez			
López Sánchez, José María			
Lopez Sanchez, J M	1		

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Lopez, J M	1	2	1
84. Miguel López Soler			
López Soler, Miguel			
Lopez Soler, M	5		
85. Manuel López-Cantarero Ballesteros			
López-Cantarero Ballesteros, Manuel			
Lopez-Cantarero Ballesteros, M	11		4
Lopez Cantarero, M	4		2
Lopez-Canterero Ballesteros, M†	1		
Lopez-Cantero Ballesteros, M†	1		
Lopez-Castanero Ballesteros, M†	1		
Lopezcantarero, M.		2	
86. José Antonio Lorente Acosta			
Lorente Acosta, José Antonio			
Lorente Acosta, J A	2		2
Lorente, J A	1	6	17
Acosta J.A.L.		2	
Lorente, J.		1	
87. Miguel Lorente Acosta			
Lorente Acosta, Miguel			
Lorente Acosta, M	1		1
Lorente, M.		5	
Acosta, M.L.		1	
88. Juan De Dios Luna Del Castillo			
Luna Del Castillo, Juan De Dios			
Dios Luna, J De	1		
Luna, J D	3	12	12
Luna Del Castillo, J	1		2
Luna Del Castillo J D	6		4
Lunadelcastillo, J.D.		1	
Luna, J.		1	1
De Dios Luna Castillo, J.			1
De Dios, = Luna del Castillo J			1
De Dios Luna, J.			3
89. José Luis Malde Veiga			
Malde Veiga, José Luis			
Malde, J L	20	1	1
Malde Veiga, J L	5		
Malde Viega, J L†	1		
90. José Maldonado Lozano			
Maldonado Lozano, José			
Maldonado, J	6	3	9
Maldonado Lozano, J	8		4
91. Antonia Maldonado Martín			
Maldonado Martín, Antonia			
Maldonado Martin, A	15		18
Maldonado, A.		1	2
Maldonadomartin, A.		1	18
Martin, A.M.		3	
92. María Del Carmen Maroto Vela			
Maroto Vela, María Del Carmen			
Maroto, C	5	3	2
Maroto, M C	25	14	29
Maroto Vela, C	1		
Maroto Vela, M C	8		7
Maroto Vela, M. = del C			2
93. Antonio Martín Andrés			
Martín Andrés, Antonio			
Martin, A	5		1
94. Maria Del Carmen Martín Galindo			
Martín Galindo, Maria Del Carmen			
Martin Galindo, C	3		
95. Fulgencio Martínez Tormo			
Martínez Tormo, Fulgencio			
Martinez, F.		1	
96. Luis Megías Megías			
Megías Megías, Luis			
Megias, L.		2	1
Megiasmegias, L.		3	
97. Juan Antonio Mérida Velasco			
Mérida Velasco, Juan Antonio			
Merida Velasco, J A	1		10
Meridavelasco, J.A.		8	
98. María Teresa Miranda León			
Miranda León, María Teresa			
Miranda Leon, M T	1		
Miranda, M.T.		2	
99. Francisco Julio Miras Parra			
Miras Parra, Francisco Julio			
Miras Parra, F	1		
Miras Parra, F J	2		2
100. Juan Antonio Molina Font			
Molina Font, Juan Antonio			
Molina Font, J	4		4
Molina Font, J A	32		21
Molina, J	2		5
Molina, J A	10	2	3
Molinafont, J.A.		3	
Font, J.A.M.		2	
Molina, A.			1
101. Adolfo Montero Peña			
Montero Peña, Adolfo			
Montero, A	3	1	1
102. Inmaculada Rosa Montes Ramírez			
Montes Ramírez, Inmaculada Rosa			
Montes, R.			1
103. María Del Mar Morales Hevia			
Morales Hevia, María Del Mar			
Morales Hevia, M M	2		
104. Miguel Angel Motos Guirao			
Motos Guirao, Miguel Angel			
Motos Guirao, M A	1		
Motos, M A	3	2	2
Motus Guirao, M A†	1		
105. Antonio Muñoz Hoyos			
Muñoz Hoyos, Antonio			
MuñOz, A	9	4	2
MuñOz Hoyos, A	19		9
Munozhoyos, A.		8	
Hoyos, A.M.		1	
106. Ramón José Naranjo Sintes			
Naranjo Sintes, Ramón José			
Naranjo, R	11	5	7
Naranjo Sintes, R	45		4
Naranjo Sintes, R J	1		
Naranjosintes, R.		1	
Sintes, R.N.		1	
107. Eduardo Narbona López			
Narbona López, Eduardo			
Narbona, E	13	2	
Narbona Lopez, E	9		5
108. Luis Navarrete López-Cozar			
Navarrete López-Cozar, Luis			
Navarrete, L	21		1

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Navarrete Lopez-Cozar	1		
Navarrete Lopez-Cozar, L	6		1
Lopez Cozar, L.N.			1
109. Francisco Navarro Freire			
Navarro Freire, Francisco			
Navarro Freire, F	5		2
Navarro, F.		1	
110. Rafael Navarro Pichardo			
Navarro Pichardo, Rafael			
Navarro Pichardo, R	4		
Navarro, R	1		
111. Benigno Neira Antonio			
Neira Antonio, Benigno			
Neira Antonio, B	1		1
112. Francisco Nogales Fernández			
Nogales Fernández, Francisco			
Nogales, F	6	9	3
Nogales, F F	3	21	20
Nogales Fernandez, F	27		4
113. Juan Ocaña Sierra			
Ocaña Sierra, Juan			
Ocaña Sierra, J	3		
Ocana, J.		1	
114. Nicolás Olea Serrano			
Olea Serrano, Nicolás			
Olea Serrano, N	2		1
Olea, N		17	15
115. Rosa María Ortega Del Olmo			
Ortega Del Olmo, Rosa María			
Ortega Del Olmo, R	1		
Ortega Del Olmo, R M	12		4
116. Esperanza Ortega Sánchez			
Ortega Sánchez, Esperanza			
Ortega, E	2	8	8
117. José Ignacio Osuna Carrillo De Albornoz			
Osuna Carrillo De Albornoz, José Ignacio			
Osuna, J.I.		2	2
Osuna, I.		3	
118. Francisco Javier O'valle Ravassa			
O'valle Ravassa, Francisco Javier			
O'valle, F	7		17
O'valle Ravasa, F†	1		
O'valle Ravassa, F	4		4
Valle Ravassa, F O'	1		
Ovalle, F.†		19	
Ovalleravassa, F.		1	
Ravassa, F.O.		4	
Ovall, F.J.†		1	
O'Vall, F. J.†			1
119. María Teresa Pascual Morenilla			
Pascual Morenilla, María Teresa			
Pascual Morenilla, M. T.			1
120. José María Peco Malagón			
Peco Malagón, José María			
Peco, J M	1		
121. Vicente Pedraza Muriel			
Pedraza Muriel, Vicente			
Pedraza Muriel, V	3		
Pedraza, V	51	16	17
122. José María Peinado Herreros			
Peinado Herreros, José María			
Peinado, J M	1	2	
123. Juan Francisco Peña Angulo			
Peña Angulo, Juan Francisco			
PeñA Angulo, J F	1		1
PeñA, J F	2	3	1
Pena, J.		2	
124. Arsacio Peña Yañez			
Peña Yañez, Arsacio			
PeñA, A	1		
125. Francisco M Pérez Benítez			
Pérez Benítez, Francisco M.			
Perez Benitez, F	4		3
Perez Benitez, F M	1		
126. Francisco Pérez Blanco			
Pérez Blanco, Francisco			
Perez Blanco, F	2		1
Perez Blanco, F J*	14		22
Perezblanco, F.		1	
Perezblanco, F.J.*		4	
127. Anastasio Pérez García			
Pérez García, Anastasio			
Perez, A	1	1	
Perez Garcia, A	1		
128. Gonzalo Piedrola Angulo			
Piedrola Angulo, Gonzalo			
Piedrola Angulo, G	6		7
Piedrola De Angulo, G*	2		1
Piedrola, G	25	17	27
Peidrola De Angulo, G†	1		
Piedrola, D.			1
129. Elena Pita Calandre			
Pita Calandre, Elena			
Pita Calandre, E		10	1
Pita, E	1		
Calandre, E.P.		4	4
130. Esperanza Del Pozo Gavilán			
Pozo Gavilán, Esperanza Del			
Pozo, E Del	5		
Pozo Gavilan, E	2		
Delpozo, E.		7	
Del Pozo, E.			13
131. Nicolás Prados Olleta			
Prados Olleta, Nicolás			
Prados Olleta, N.			1
132. Emilio Puche Cañas			
Puche Cañas, Emilio			
Puche CañAs, E	2		1
Puche, E	9	2	6
133. José Pulido Caballero			
Pulido Caballero, José			
Pulidocaballero, J.		2	
Pulido Caballero, J.			2
134. José Raya Muñoz			
Raya Muñoz, José			
Raya, J	1	3	1
Raya MuñOz, J	8		8
135. Francisco Revelles Marín			
Revelles Marín, Francisco			
Revelles, F.		3	
Marin, F.R.		1	
136. José Rico Irles			
Rico Irles, José			

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Rico Irles, J	18		14
Rico, J.			2
Irles, J.		1	1
137. José Francisco Robles Garzón			
Robles Garzón, José Francisco			
Robles, J F	1		
138. José Arcadio Roda Moreno			
Roda Moreno, José Arcadio			
Moreno, J. A.			1
139. Antonio Rodriguez Cuartero			
Rodriguez Cuartero, Antonio			
Rodriguez Cuartero, A	22		53
Rodriguez, A	4	1	
Rodriguezcuartero, A.		7	
140. Jose Manuel Rodriguez Ferrer			
Rodriguez Ferrer, Jose Manuel			
Rodriguez, J	1		
Ferrer, J.M.R.		8	
Rodriguez, J. M.			1
141. Esteban Rodriguez Ocaña			
Rodriguez Ocaña, Esteban			
Rodriguez, E	6	1	3
142. Eduardo Ros Die			
Ros Die, Eduardo			
Ros Die, E	7		3
143. Jorge Rosell Pradas			
Rosell Pradas, Jorge			
Rosell, J	7	3	9
Rosell Pradas, J	21		12
Pradas, J.R.		2	
144. Francisco Javier Ruiz Carazo			
Ruiz Carazo, Francisco Javier			
Ruiz, F.		1	
Ruiz, J.		1	
145. Ángeles Ruiz Extremera			
Ruiz Extremera, Ángeles			
Ruiz Extrema, A	19		14
Ruii, A†	1		
Ruiz, A	1	1	
Ruizextremera, A.		5	
Extremera, A.R.		1	
146. Manuel Ruiz Morales			
Ruiz Morales, Manuel			
Ruiz, M	3	1	4
Ruiz Morales, M	12		12
Ruizmorales, M.		2	
147. Carlos Ruiz Ogara			
Ruiz Ogara, Carlos			
Ruiz Ogara, C	8		
Ruiz, C	1	11	7
148. Maria Estrella Ruiz Requena			
Ruiz Requena, Maria Estrella			
Ruiz Requena, E	5		3
Ruiz Requena, M E	8		12
Ruiz, E	4		8
Ruizrequena, E.		2	
Ruizrequena, M.E.		6	
Requena, M.E.R.		2	
Ruiz, M. E.			1
149. José Mariano Ruiz De Almodovar Rivera			
Ruiz De Almodovar Rivera, José Mariano			
Almodovar, J M R	1		
Ruiz De Almodovar, J M	17		14
Ruiz De Almodovar, M	5		3
Ruiz De Almodovar Rivera, J M	1		
Ruiz De Almodovar Rivera, M	1		
Ruiz Almodovar, J M	3		
Ruiz Almodovar, M	1		
Dealmodovar, J.M.R.		15	
Dealmodovar, M.R.		2	
150. Rosa María Sabatel López			
Sabatel López, Rosa María			
Sabatel Lopez, R	2		
Sabatel Lopez, R M	10		
Sabatel, R M	3	4	
Sabatell Lopez, R M†	1		
151. Margarita Sainz De Aja Machuca			
Sainz De Aja Machuca, Margarita			
Sainz, M	2		4
152. Francisco Javier Salmerón Escobar			
Salmerón Escobar, Francisco Javier			
Salmeron, Escobar, F J	9		7
Salmeron, F J	2	6	4
Salmeron, J	2	3	1
153. Vicente Salvatierra Mateu			
Salvatierra Mateu, Vicente			
Salvatierra Mateu, V	6		
Salvatierra, V	26		
Salvatierrra, V†	1		
154. Domingo Salvatierra Rios			
Salvatierra Rios, Domingo			
Salvatierra Rios, D	3	2	
Salvatierre Rios, D	12		10
Salvatierre Rios, D†	1		
Salvatierrarios, D.		2	
Rios, D.S.		1	
155. María Del Carmen Sánchez Quevedo			
Sánchez Quevedo, María Del Carmen			
Sanchez Quevedo C	1		
Sanchez Quevedo, M C	4		8
Sanchez, M C	2		
Sanchezquevedo, M.C.		6	
156. Roberto Saucedo Sánchez			
Saucedo Sánchez, Roberto			
Saucedo, R	12	3	8
Saucedo Sanchez, R	5		3
Sanchez, R.S.		1	1
157. Tomás Segura Sánchez			
Segura Sánchez, Tomás			
Segura Sanchez, T	1		
Segura, T	4		
158. Salvio Serrano Ortega			
Serrano Ortega, Salvio			
Serrano Ortega, S	31		5
Serrano, S	3	4	4
Serranoortega, S.		2	
Ortega, S.S.		1	
159. Pilar Soler Arrebola			
Soler Arrebola, Pilar			
Soler Arrebola, P	4		
160. Agatangelo Soler Díaz			
Soler Díaz, Agatangelo			
Soler, A.		7	3

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161. Miguel Soler Viñolo			
Soler Viñolo, Miguel			
Soler, M	5		
Soler ViñOlo, M	2		
162. Pablo Torne Poyatos			
Torne Poyatos, Pablo			
Torne Poyatos, P	2		1
163. Fernando Elías Torres Alcalde			
Torres Alcalde, Fernando Elías			
Torres, E	6		
164. Francisco Torres González			
Torres González, Francisco			
Torres Gonzalez, F	1		
165. Antonio Valenzuela Ruiz			
Valenzuela Ruiz, Antonio			
Valenzuela Ruiz, A	11		3
Valenzuela, A	4	8	11
Valenzuelaruiz, A.		1	
166. Rafael Vara Thorbeck			
Vara Thorbeck, Rafael			
Vara, R	1		2
Vara Thorbeck, R	27		29
Varathorbeck, R.		4	
Thorbeck, R.V.		2	
167. José Félix Vargas Palomares			
Vargas Palomares, José Félix			
Vargas, F	5	26	17
168. Mercedes Villalobos Torres			
Villalobos Torres, Mercedes			
Villalobos Torres, M	1		
Villalobos, M.		13	9
169. Enrique Villanueva Cañadas			
Villanueva Cañadas, Enrique			
Villanueva Cañadas, E	2		1
Villanueva, E	7	26	42
Villaneuva, E.†		1	
Canadas, E.V.		1	
Canadas, E.			1
170. Francisco Vives Montero			
Vives Montero, Francisco			
Vives, F	1	6	2
Vivesmontero, F.		1	
Montero, F.V.		1	
Vives Montero, F.			2
171. María Luisa Wihelmi De Cal			
Wilhelmi De Cal, María Luisa			
Wilhelmi De Cal, M L	2		
172. Armando Zuluaga Gómez			
Zuluaga Gómez, Armando			
Zuluaga Gomez, A†	1		1
Zuluaga, A	4	3	7
Zuluaga Gomez, A	29		
Zuloaga, A	4		2
Zuloaga, = Gomez A†			27